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Sanitized Copy Approved for Release 2011/04/08 :
CIA-RDP81-00280R000200090011-5

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DEVELOPMENT OF A TELEVISION TRANSMISSION NETWORK IN THE USSR

Radio, No 2,
February 1956,
Moscow, Pages 32-33

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The past five-year plan marked the beginning of a vast development of TV broadcasting in the USSR. During that time TV centers were built in Kiev, Riga, Kharkov, Tallinn, Sverdlovsk, Omsk, Tomsk, and other cities. In the organization of television broadcasting in Omsk, Minsk, Tomsk, and Vladivostok radio amateur equipment was used that had been created with the assistance of institutions and enterprises of these cities.

Substantial work in the construction of amateur television centers was also done by the radio amateurs and radio specialists of Voronezh, Gorkiy, Kazan, Nalchik, and other cities.

In 1955 the TV rebroadcasting center in the city of Kalinin was put into operation; its programs are transmitted by cable line from Moscow.

In 1956 television centers must begin operation in Baku, Tbilisi, Yerevan, Tashkent, Vil'nyus, Stalino, and other cities.

A powerful TV rebroadcasting center must also be put into operation in Stalinogrosk; it can service Stalinogrosk, Tula, and also adjacent Mosbass [Moscow coal basin] districts.

In 1956 television centers will be built in Stalingrad, Saratov, Kazan, Novosibirsk, Krasnoyarsk, Vladivostok, Kemerovo, Dnepropetrovsk, Odessa, Lvov, Karaganda, Ufa, Alma-ata, Rostov-on-Don, Chelyabinsk, and other cities.

It is planned in 1956 to launch construction of TV rebroadcasting centers in Ryazan, Novgorod, and other cities. In the next year or 2 a TV radio-relay line must be constructed from Moscow to the cities of Ivanovo, Yaroslavl, and Kostroma, and rebroadcasting stations built in these cities.

In 1956 it is planned to construct small rebroadcasting TV stations that will permit expanding the broadcast range of TV centers. Such installations will be erected in the Moscow Oblast, in the Kiev Region, in Belorussia, the Latvian and Estonian SSR's etc.

The live TV broadcasts from theaters, stadiums, etc enjoy great popularity among the people. At present the TV centers of Moscow, Leningrad, Kiev, and Riga are equipped with mobile television stations. In the future all TV centers that have their own programs will receive such mobile stations.

Standard TV transmitting equipment is being produced by industry for outfitting the TV centers already being built. For the small television rebroadcasting stations, an ultrashortwave television radio station has been developed with a picture signal transmitter of 2 kw capacity and a sound accompaniment transmitter of one kw capacity. The radio tubes are air cooled. The transmitters have high quality indexes and operate in one common antenna-feeder system with an antenna of the turnstile type.

An ultrashortwave television radio station with picture signal transmitter of 5 kw capacity and sound transmitter of 2.5 kw is at present used at the majority of TV centers. The radio tubes of the output stages of both transmitters are water cooled. In the picture signal transmitter modulation is realized in the preliminary stages with further amplification of the modulated oscillations. Control is accomplished from a general switchboard, equipped with video-control devices. By means of these devices the quality of the signal can be checked in the main sections of the transmitter circuit. These transmitters operate in a common antenna-feeder system with antenna of the turnstile type.

An ultrashortwave television radio station with a picture signal transmitter of 15 kw capacity and a sound transmitter of 7.5 kw has also been developed.

The television equipment being produced is accomodated in 2 sets, one of which is designed for conducting studio transmissions, and the other for film transmissions.

The general equipment (synchrogenerators, linear amplifiers) are put in the film transmission set which is simultaneously the central set of the TV center.

Provided in the film set are 3 camera channels, and in the studio set there are 2. Each camera channel consists of a transmitting camera, an intermediate amplifier, and a viewing device equipped with an oscillograph.

The Shmakov-Timofeyev transmitting tubes are installed in the studio cameras. The illumination of objects transmitted cannot exceed 1,500-2,000 lux. The studio cameras are supplied with a set of lenses having focusing distances of 28, 50, 100, and 135 mm. During transmission the operator who is taking the TV picture can quickly replace one lens with another by means of a revolving head which he controls.

A system based on impulse lighting of the frame is used for projection of motion picture films on the photocathode of the transmitting tube.

The entire amplifying and control equipment, the feed block, the synchrogenerator are accomodated in the sets control boards.

A mobile television station of the PTS-52 type is being produced by industry. This station is installed in 2 ZIS-155 motor vehicles; the main equipment including the control board, 3 camera channels, camera feed equipment, the system of synchronization are located in one motor vehicle, the set vehicle. Auxiliary equipment and reels with cables are installed in the second motor vehicle. The mobile TV station operates on 3 cameras with highly sensitive tubes of the orthicon type with transfer of picture. Autonomous synchronization is applied in the portable TV station for which purpose a separate synchrogenerator is used.

Television relaying points are being constructed in Moscow and Leningrad for improvement of live out-of-studio TV broadcasting. The relaying point has already begun operations in Leningrad.

The equipment of the stationary TV relaying station permits installation in auditoriums of up to 3 transmitting cameras with highly sensitive tubes, connected by cables with the equipment of the relaying point's set, where we find the technical personnel and stage directors who conduct the television transmission.

In the Sixth Five-Year Plan a vast development of the television network

is projected for the purpose of developing TV broadcasting in USSR and raising the quality of television transmissions.

It is planned in the next 3 years to increase the number of TV centers and rebroadcasting stations approximately 5-fold.

It has been decided to construct TV centers in all capitals of union republics and in the largest industrial centers of the country.

The large territory of USSR and the need in a number of cases to organize national TV programs in the languages of the peoples of USSR makes it necessary to construct a considerable number of TV centers that have their own programs.

Along with this, construction will be carried out of rebroadcasting TV centers and stations which as a rule will be set up on the routes of radio-relay and cable main lines.

The State Union Designing Institute of the Ministry of Communications USSR has at present developed a standard design TV center, on the basis of which it is planned to accomplish the construction of TV centers in a number of cities of the Soviet Union. The design provides for construction of a TV center intended to service with television broadcasts viewers who reside within a radius of 50 to 60 km from the place where the TV center is erected.

The TV center will accomplish single-program television broadcasting, transmission from the studio and motion picture film, and out-of-studio transmissions by means of a mobile television station.

The TV center is equipped with an ultrashortwave television radio station having a picture signal transmitter of 5 kw capacity and a sound accompaniment transmitter of 2.5 kw, television equipment with tele-film projecting and portable television station, 4 ultrashortwave frequency modulated broadcasting transmitters operating in pairs with composition of powers being radiated in the ether.

The set of studio equipment and the ultrashortwave television radio station are put in separate buildings which can be situated at one site or at sites separated a distance of up to 10 km.

In case of such removal, the television program is delivered to the ultrashortwave television radio station through a special radio-relay line.

The TV center has 2 studios: the main area of 300 m^2 and the scene-model-announcer area of 40 m^2. The height of the antenna tower is 180 m, the total height with antenna reaches 192 m.

The TV center has all the necessary services for creative and technical personnel, a film library, garage, and others. Air conditioning is provided. Also being developed is a standard design of TV center combined with radio broadcasting studios and sets that side by side with TV broadcasting permit improvement of the quality and program of local radio broadcasting.

In a number of cities TV centers will be created that are intended mainly for rebroadcasting television transmissions. The centers are equipped with a small studio and television film transmitting equipment.

Still another standard design is being developed, of a low-power television station which will be installed on the boundary of certain reception of the TV center. With the radiated power of such a station of the order of

100 w, its certain reception is secured within a radius of 5 to 8 km, which in a number of cases proves to be quite enough.

All TV centers will be equipped with ultrashortwave frequency modulated broadcasting transmitters which will facilitate the development of radio broadcasting on ultrashortwaves in 2 programs simultaneously.

The development of television broadcasting requires the creation of a base for the production of television programs and also the wide construction of radio-relay and cable main lines for relaying the television broadcast of the Moscow TV center to other cities.

Fundamental reconstruction of the Moscow TV center must be carried out in the next 2 to 3 years to solve this problem and also substantially improve the quality of the television broadcast.

Major tasks have been assigned to the workers of the Ministry of the Radio Engineering Industry. The tempo of development of television in the country depends a great deal on them. The most important task is development and production of ultrashortwave transmitters of varied capacity, highly effective antennae, the mastery of the range above 100 megacycles to increase the number of television channels, the output of modern studio and film transmitting TV equipment.

The industry must organize the output of film transmitting television equipment on the "running ray" system, of highly sensitive transmitting tubes for work in studios, equipment of optical and electrical "rearprojection," equipment for taking television programs on motion picture film from the screen of the receiving tube, portable monoscope installations, convenient cranes for lifting and shifting television studio cameras together with the operators.

Considerable work must be done in the improvement of equipment for out-of-studio television transmissions. It is necessary to develop and organize the output of inexpensive and easy-to-operate portable television stations installed in one motor vehicle, etc.

Reduction in the cost of television equipment is essential for the vast development of the television transmission network.

Experiments in the use of aircraft must be conducted for enlarging the broadcast range of TV centers. Such a method was proposed by professor P. V. Shmakov already in 1936, but did not find practical realization, although it is known that the broadcast range of a television transmitter of one kw capacity in all, raised to an altitude of 5,000 to 6,000 m, reaches 350-400 km.

The shortage of frequency channels for television broadcasting requires their economic utilization. This can be achieved by using the system with the bias of the carrying frequencies of the television transmitters at a frequency equal to one-half the line frequency. The use of this system however requires developed, highly-stable exciters for television transmitters.

For the organization of interurban and international exchange of television programs, it is essential that the receiving and transmitting television equipment can operate irrespective of the frequency of the supplying electric network.

The radio industry should rush work on the output of such equipment.

It is extremely important that in the process of developing and producing